RESEARCH PLAN PROPOSAL

DEVELOPMENT OF A FRAMEWORK FOR SELECTION OF AN APPROPRIATE SOFTWARE AS A SERVICE PRODUCT OF CLOUD COMPUTING

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Introduction:

Software as a Service (SaaS) is a software delivery model in which the software is hosted by someone else's system and delivered via web, on customer's demand and pay as they use. These days, number of service providers is available to serve SaaS services therefore enterprises need to adopt an objective approach to ensure that they select the most appropriate SaaS product as per their needs.

The aim of our research is to develop a frame work for appropriate selection of SaaS product. Frame work will cover most of the technical issues specifically customization, reliability and usability and some of non technical related issues will also be included which should be analyzed while the selection of SaaS services and define the criteria for adopting appropriate soft ware as a service. Existing research work has got limitations as they cover less on technical issues and emphasized more on non technical issues such as vendor's reputation, cost, sales performance management and sales analysis. The research initiates with a study of various technical parameters of Software as a service in cloud computing and emphasizing specially on the technical issues such as customization, functionality, usability, speed, etc. Developing frame work will helpful for organization to select an appropriate soft ware as service.

SasS is one of the service model of Cloud computing. Cloud computing is the current revolution in IT services. Cloud computing is a technology in which computing resources [networks, servers, storages, applications and services] are shared. Cloud service provider serves these services to cloud service consumer and charges for the processing power and bandwidth that is actually used.

Review of literature:

1. Cloud Computing

Cloud computing is a new cost-efficient computing paradigm in which information and computer power can be accessed from a Web browser by customers.[16] The basic principles of cloud computing is to make the computing be assigned in a great number of distributed computers, rather then local computer or remoter server. The running of the enterprise's data center is just like Internet. This makes the enterprise use the resource in the application that is needed, and access computer and storage system according to the requirement. [17]

1.1 Definitions of cloud computing considering various aspects:

Gartner defines, “cloud computing is a style of computing where massively scalable IT-enabled capabilities are delivered ‘as a service’ to external customers using Internet technologies.”[18]

According to Wikipedia, Cloud computing is a style of computing in which dynamically scalable and often virtualized resources are provided service over the Internet. Users need not have knowledge of, expertise in, or control over the technology infrastructure in the "cloud" that supports them. [19]

The National Institute of Standards and Technology (NIST) defines cloud computing in a specific manner, by this we can understand the cloud computing in a better way, that: "Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." [8]

Amita Tiwari discussed in the journal of Compliance, 2009 issue 9, that the idea of cloud computing is based on a very fundamental principal of reusability of IT capabilities where cloud is a pool of scalable IT-enabled capabilities which can be utilized over the Internet as a service.[14]

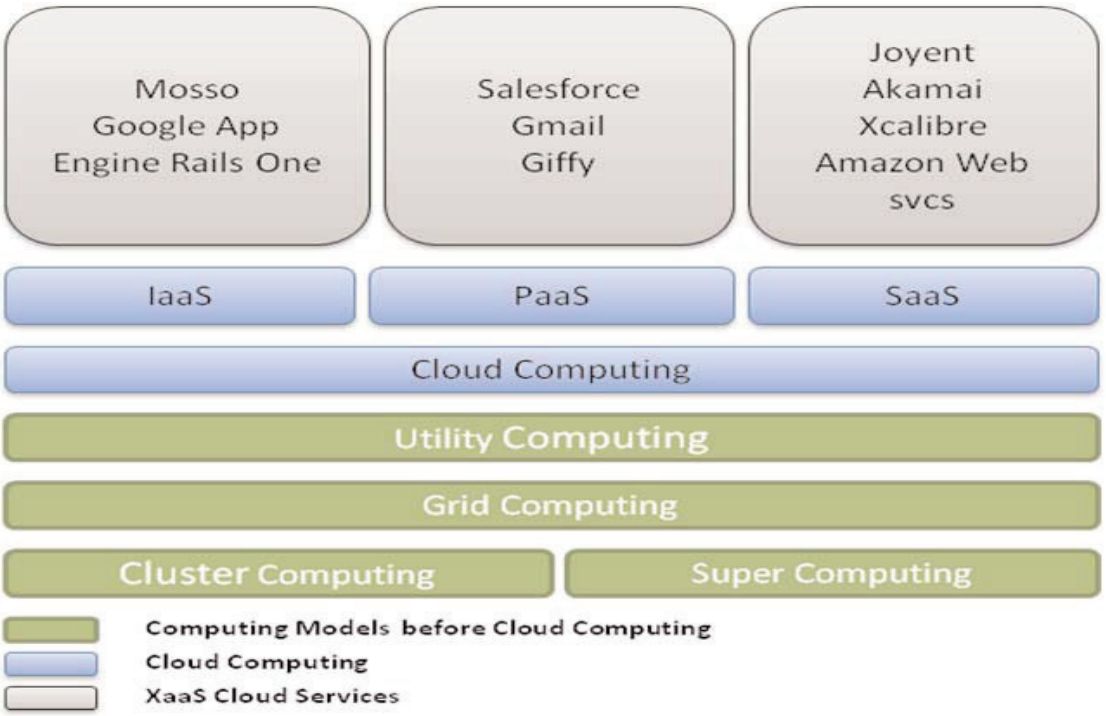

Figure 1: Steps to cloud computing [14]

Figure 1 clearly explains the evolution steps of cloud computing and its models. Cloud computing model also provides XaaS, cloud services based on 'everything as a service' concept. IaaS, PaaS, and SaaS are the three basic components of this complete cloud service model. [14]

1.2. Key features of cloud computing:

1. On-demand self-service: A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service's provider. [8]

2. Cost: This technique greatly reduced the capital expenditure because infrastructure is typically provided by a third-party and does not need to be purchased for one-time or infrequent intensive computing tasks. [19]

3. Reliability: Take advantage of a massive computing platform, without having to build and buy your own. Improve your organisations infrastructure SLA's by using a highly redundant and resilient platform that has no single points of failure. [2]

4. Flexibility: Add and remove resources on-the-fly (or script tolerances!) to cope with peaks in your requirements. Only pay for what you need. [2]

5. Scalability: Grow your deployment rapidly, as required, without huge capital costs or operational time. [8]

6. Multi-tenancy: enables sharing of resources and costs across a large pool of users. [19] Jeff Kaplan, Managing Director of THINK strategies, a leading SaaS and cloud consulting firm, believes multi-tenancy is essential for market leadership, operational efficiencies and ongoing customer retention [1]

7. Fast Setup: React the decisions or requirements quickly and deploy complex architecture's rapidly. [2]

8. Shared resources/common versions: the shared asset approach improves supplier and customer economics; there is some ability to customize "around" the shared services, via configuration options within the service, workflow/process management among services etc. [5]

1.3 Cloud computing service model [9]

Cloud computing can provide three kinds of service models, including

IaaS: Infrastructure as a service

PaaS: Platform as a service

SaaS: software as a service

1. IaaS: IaaS refers to the services provided to the users is to lease the processing power, storage, network and other basic computing resources, with which users can deploy and run any software including operating systems and applications.[9] The consumer can control the operating system, storage, deployed applications and possibly networking components such as firewalls and load balancers. Infrastructure-as-a-Service provides virtual server instances with unique IP addresses and blocks of storage on demand. Customers use the provider's application program interface (API) to start, stop, access and configure their virtual servers and storage. In the enterprise, cloud computing allows a company to pay for only as much capacity as is needed, and bring more online as soon as required. [11] To all these services, there is no need for users to manage or control the cloud infrastructure, including network, server, operating system, storage and even the functions of applications. [9]

.**2. PaaS:** PaaS refers to deploy the applications created by the development language and tool say Java, python, .net etc. provided by the service providers to the cloud infrastructure. [9] *Platform as a Service* (PaaS) provides a software platform on which users can build their own applications and host them on the PaaS provider's infrastructure. The software platform is used as a development framework to build, debug, and deploy applications. It often provides middleware-style services such as database and component services for use by applications. PaaS is a true cloud model in that applications do not need to worry about the scalability of the underlying platform (hardware and software. [12]

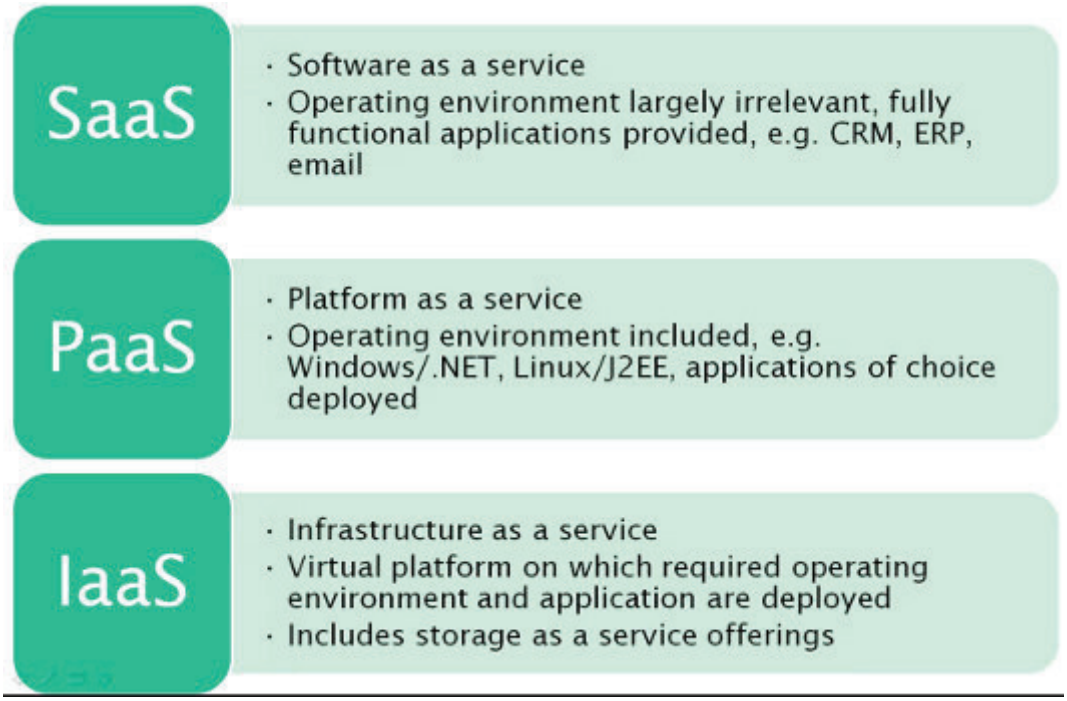
SaaS
· Software as a service
· Operating environment largely irrelevant, fully functional applications provided, e.g. CRM, ERP, email
PaaS
· Platform as a service
· Operating environment included, e.g. Windows/.NET, Linux/J2EE, applications of choice deployed
IaaS
· Infrastructure as a service
· Virtual platform on which required operating environment and application are deployed
· Includes storage as a service offerings

Figure 2: differences between SaaS, PaaS, and IaaS [15]

3. SaaS: SaaS means the service provided to client is the applications running on the cloud computing infrastructure provided by the service providers. It can access by thin client interfaces such as browser etc. The detailed overview of SaaS is being presented in the next section. SaaS is the main thrust area of our research so we will emphasize more on this model in the next section.

2. Software as a Service (SaaS):

The software as a service (SaaS) model is a way of providing the same software to different customers via a network, usually the Internet. In other words, the software is not hosted on the customers' individual computers. Under the SaaS model, a vendor is responsible for the creation, updating, and maintenance of software. Customers buy a subscription to access it, which includes a separate license, or seat, for each person that will use the software. [13] SaaS shifts software deployment and maintenance burdens to the service provider, freeing up resources for other projects. IT is at the mercy of the provider for availability, data security, regulatory compliance, and other key issues. [4] The basic idea behind Software as a Service (SaaS) is simple with SaaS, an entire finished application can be available on-demand from some SaaS vendor. The application exists in the cloud (not in an on-premise datacenter) and can be consumed from any browser. Therefore, the customer of a SaaS vendor is the end user. [10]

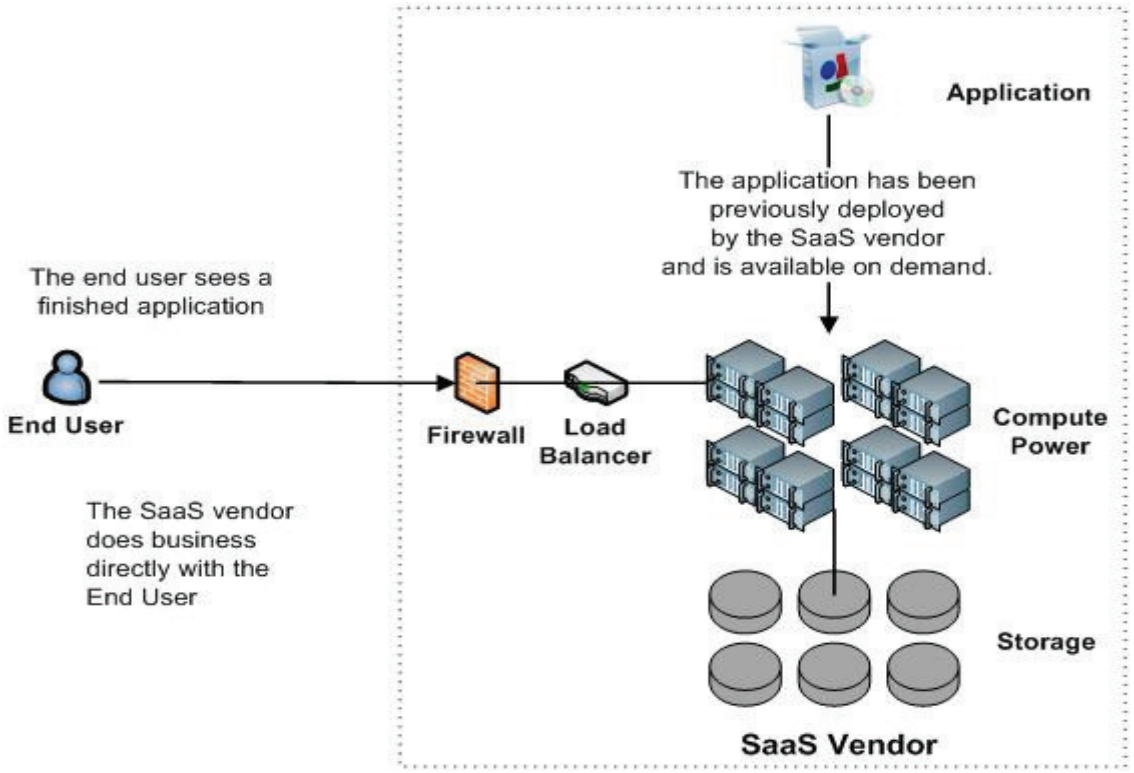
Application
The application has been previously deployed by the SaaS vendor and is available on demand.
The end user sees a finished application
End User
Firewall
Load Balancer
Compute Power
Storage
The SaaS vendor does business directly with the End User
SaaS Vendor

Figure 3 – Software as a Service [10]

This is shown in Figure 3. Here we see that the SaaS vendor is not only offering an entire application to the end user but that the SaaS vendor is also responsible for providing the compute power, storage, and networking infrastructure necessary to run the application. [10]

2.1 Characteristics of SaaS: [3]

1. All of the activities are managed from a central location rather than at each user's individual location, allowing modifications and troubleshooting to be accomplished quickly by the application vendor and eliminating the need for end-user upgrades or patches.

2. Application are network based so that the business user free to use the service from anywhere that they choose using virtually any type of electronic device. Each application is pay-per-usage basis, allowing the business owner to predict their budget for the usage of number of applications according to business need.

3.Application delivery typically based on one-to-many model comprise of single instance, multi-tenant architecture, where an application is shared across multiple user.

4.Automated and centralized updating eliminates the need for end-users to download patches and upgrades.

5.Managing Complexity while reducing software costs.

6.SaaS make possible to have regular integration with a large network of software which can communicate in the form of a mashup, or in the form of a platform.

7.SaaS is highly efficient as Multi-tenant structural design makes the source code is same for every customer.

8. Unlike traditional apps where customization means, by simple configuration, SaaS can meet any requirement such as functional, data integration etc.

9. Any new tech-innovation is easily integrated by the service provider; the source code is same for every customer and is available for all the subscribers.

2.2 Types of SaaS [20]

1. Business Utility SaaS: Applications like Salesforce automation are used by businesses and individuals for managing and collecting data, streamlining collaborative processes and providing actionable analysis. Most popular uses are respectively: Customer Relationship Management (CRM), Human Resources and Accounting.

2. Social Networking SaaS: Applications like Facebook are used by individuals for networking and sharing information, photos, videos, etc.

3. Review of Existing Research related to SaaS

Lee et. al. (2009) define the key features of SaaS developing a quality model for evaluating SaaS in their paper "A Quality Model for Evaluating Software-as-a-Service in Cloud Computing**"** these features are as follows :[7]

1. Reusability: In software engineering, reusability is the ability of software elements to serve for the construction of many different applications.

2. Data Managed by Provider: SaaS is a model of software deployment whereby service providers license applications to customers for use as a service on demand. Thus service providers are responsible for service installation and data management on their own server. Therefore, most data which service consumers produce is stored on provider's data center and managed by provider. Thus service customers do not perceive two things.

1. Where is their data stored?
2. How can be the data managed?

3. Service Customizability: Service customizability means the ability for services to be changed by service consumers based on the individual requirements.

4. Availability: The service consumers are able to access SaaS service from a Web browser via the Internet. SaaS vendors focus their attentions to achieve high availability of services.

5. Scalability: In software engineering, scalability is a desirable property of a system, a network, or a process, which indicates its ability to either handle growing amounts of work or to be readily enlarged.

6. Reliability: This attribute measures the ability of a SaaS to keep operating with specified level of performance over time.

7. Efficiency: This attribute measures the amount of resource used for SaaS when providing the required functionality and the level of performance, under stayed condition.

As discussed by Bhardwaj et.al. (2010) in their paper "An Approach for Investigating Perspective of Cloud Software-as-a-Service (SaaS)". SaaS is becoming an increasingly ubiquitous software delivery model that support implementation of service-oriented architecture using Web services technologies. With SaaS gaining mainstream popularity, enhanced by the advent of web based computing options and virtualization platforms, the enterprise infrastructure is rapidly expanding into a large computing blurb-a' computing cloud'. SaaS is the key setting for the rapid development that Cloud Computing is creating. They investigated SaaS by describing their characteristics, reasons for adoption and applications. SaaS model make possible for every customer to take advantages of provider's latest technological features without the burden of software maintenance, management, updates and upgrades. The cloud service consumer needs simple interface software, like a simple web browser to be run on their side and the service provider needs integrated IT resources so their usage is optimized. SaaS eliminates customer worries about application servers, storage, application development and related, common concerns of IT. [3].

A report was developed and written by the senior staff of Saugatuck Technology Inc. This report is based on independent research developed and conducted by Saugatuck Technology Inc., this report describe that how to evaluate and manage the concerns related to the selection of SaaS solutions for business operations and management , and define key concern as follows .[21]

1. Viability of SaaS vendors
2. Integrating SaaS data with existing enterprise data structures
3. Integrating SaaS with existing enterprise applications
4. Availability of enterprise level technical support and maintenance
5. Ability of end users to adapt to new business processes
6. Ensuring system performance meets or exceeds
7. Service level agreements
8. Ability to customize solution to unique business requirements
9. Data and Transaction Integrity concerns
10. Data Security & Privacy concerns

As per Shields (2010), the common criteria that applies to choose a SaaS provider, these are:[22]

1. Transparency
2. Accreditation and certification
3. Compliance
4. Financial stability
5. Adequate redundancy for data storage and fault tolerance
6. Technical security safeguards
7. Physical security safeguards

Godse et.al. (2009), described various parameters in their paper “an approach for selecting appropriate saas product of cloud” to be considered while selection of SaaS product in AHP [analytical hierarchical process] technique. They propose factors for SaaS selection such as: Functionality, Architecture, Usability, Vendor Reputation, and Cost. [6]

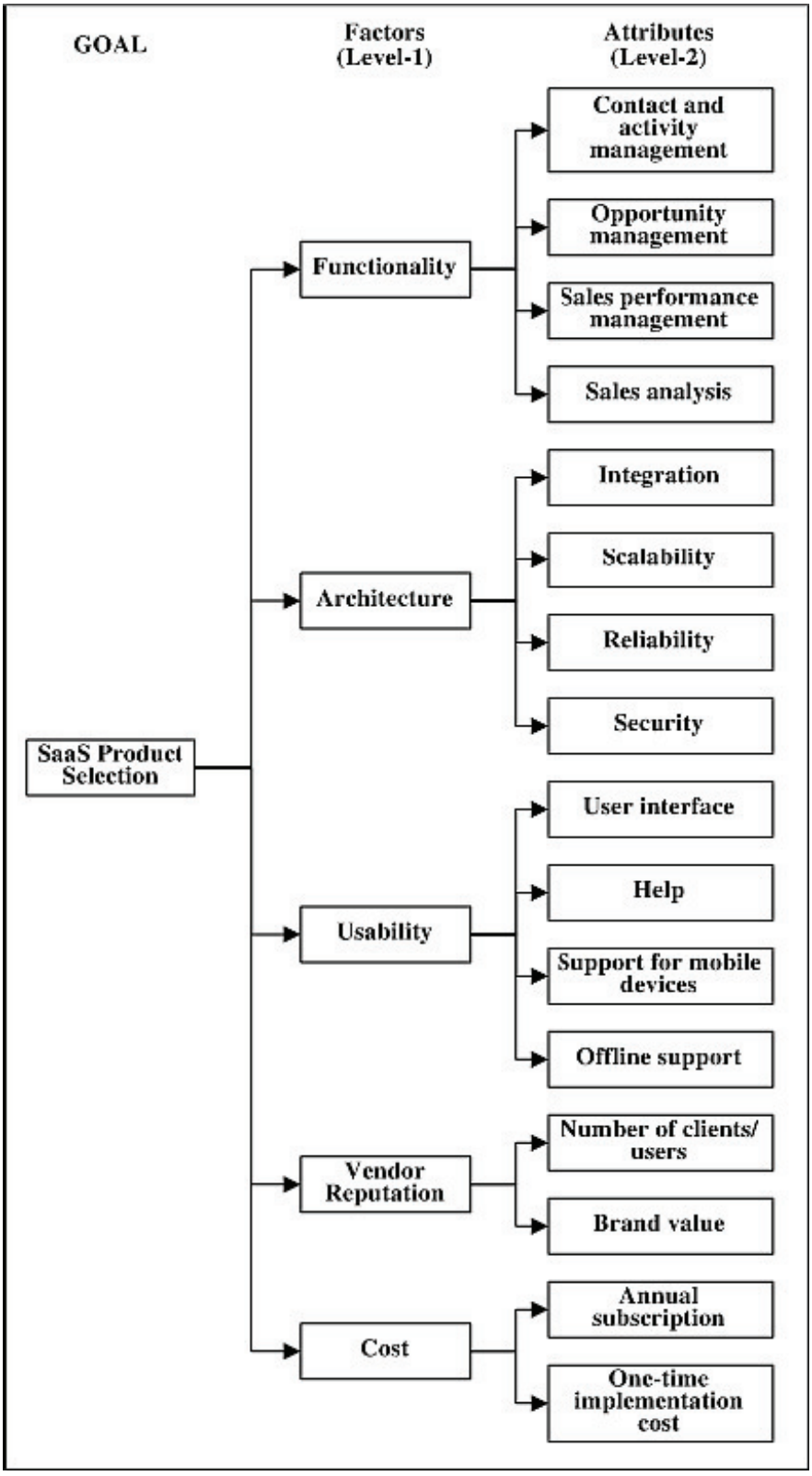

Figure 4: Hierarchy [6]

Saaty developed the Analytic Hierarch Process (AHP) method, which is very useful in simplifying multi-criteria problems into hierarchy. AHP deals with intuitive, rational and/or irrational,

multiobjective, multi-criteria decision making with certainty and/or uncertainty for any number of alternatives. The hierarchy is only for the selection of parameters. The AHP process starts with hierarchy development. An advantage of hierarchy is that it allows focusing judgment separately on each of the several properties, which is essential for making a sound decision.[6]

3. Objective of research

1. The objective of our research is to develop a framework for the selection of appropriate software as a Service (SaaS) product based on following specific technical parameters so that the organizations can fulfill their needs, for which the services are being brought:

- Customization
- Software cost Estimation
- Reliability,
- Functionality,
- Architecture,
- Usability,

The research aims to review specifically customization and usability and reliability parameters for the development of the proposed framework. The objective of this research is to provide benefits to the users the selection of best possible SaaS services for their needs because when several providers are offering SaaS based products, the selection of product becomes a significant issue which involves analysis of selection parameters and product offering by a SaaS vendor. So the research will serve a frame work that will help to make a decision for selection of appropriate SaaS product.

2. A thorough analysis of technological issues related to a Software As a Service product will be done for a user who is accessing SaaS from external server to keep the internal resources (Database, storage, applications) of the client secure and safe, and, at the same time, maintaining the desired speed (fast) and improving functionality,

3. The research will initiate with a study of various parameters of Software as a service in cloud computing emphasizing specially on the technical issues such as functionality, architecture, usability, security, speed, customization etc., then a proper analysis will enhance the research to find the limitations and possibilities in the parameters to improve the functionality of the same, the analysis will

end up with the development of the desired framework that covers all the technical parameters for an appropriate selection of software as a service product from the cloud,

4. the objective of our research is to study and analyse various parameters in software as a service of cloud computing with an attempt to suggest a generalized framework for the same, which will cover the advantages of the available process used to maintain adopting SaaS services of cloud and it will be able to provide more efficient and reliable approach for selecting more appropriate SaaS model,

5. Major Research Questions

1. What are the parameters of SaaS product?
2. How to categorize parameters of software as a service during selection process?
3. How to handle the parameters by making a thorough analysis of the same?
4. How to prepare suggestions to develop a generalized framework for adopting appropriate SaaS product?

6. Methodology

The research process will include following phases for accomplishing the objective of research to study and analyse various parameters of SaaS adoption in cloud computing networks, to suggest a generalized approach for the adopting appropriate SaaS product, which will cover the advantages of the available process used to adopt software as a Service of cloud.

6.1 Phase I: Study

The study phase will emphasis on studying the various parameters of SaaS. The current status, limitations, implementation issues specially concerned to technological, advantages and disadvantages of the available parameters and a comparison will be made in order to find out the lacking area in the terms of adopting appropriate SaaS.

6.2 Phase II: Analysis

In the next phase an analysis will be made to categorize the parameters associated with SaaS of cloud to investigate the feasibility specifications for the proposed framework of adopting appropriate SaaS

product. The matter analyzed will be presented in national/ international conferences and research journals of national/ international rapport to authenticate the work done till date.

6.3 Phase III: Design and Development

In this phase the proposed framework of accomplishing an approach for adopting appropriate SaaS product will be developed and we will try to implement the proposed framework in a cloud model of a university that we will choose in the study phase. For designing the model, various parameters studied in the analysis phase will be included and accordingly the model will be developed coping up with all the desired parameters so as to help a user for the appropriate selection of SaaS service.

6.4 Phase IV: Validation and Implementation

Validation is the process with specific intent of finding errors prior to delivery to the end user and ensuring the validity of the model.

The proposed model will be analyzed according to the various standards of validation. The work will be presented and published in national and international conferences and journals to ensure the quality of the model.

Progress of the research work and developed frame work will be refined by attending various seminar and getting ideas and suggestions from experts of this field.

In this phase the proposed framework of an approach for adopting appropriate SaaS product will be implemented in a simulated environment to achieve the objective of the system so that the approach can be referred to the real environment. The implementation phase deals with issues of quality, performance, maintenance etc.

6.5 Phase V: Preparation of thesis

At the final stage of the research, the work will be reported in the form of thesis. This report which includes three section i.e. study section, analysis section, and design section. Each section consists with different chapter to explain work done during the period of research.

7. Conclusion

The selection of best possible SaaS product satisfying most of the requirements , there is no explicit guidance available on selection of SaaS product for business application such as sales force automation.

At generic level, guidance on using quantitative methods for software selection and evaluation is available [6]. This research is primarily set out to identify and consolidate the parameters associated with Software as a service, and to formulate a framework to evaluate, categorize and handle these issues. The insights that will be gained from the research are expected to form a set of guidelines for adopting appropriate SaaS, in the form of a structured framework for selection of best SaaS product of cloud.

As a conclusion, this research will provide insight on how and why it is important to adopt appropriate SaaS product and how currently available standards can be improved to plan better to adopt appropriate SaaS services. The research aims to implement a framework for adopting appropriate SaaS product of cloud.

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